MA 1111: Linear Algebra I
Tutorial problems, November 25, 2015

1. For each of the following subsets of the set of all polynomials in one variable find out whether this subset is a subspace.
(**a**) all polynomials f of degree less than 100 such that $f(1) = 0$;
(**b**) all polynomials f of degree less than 100 such that $f(1) = f(2) = 0$;
(**c**) all polynomials f of degree less than 100 such that $f(1) \cdot f(2) = 0$.
2. For each subspace from the previous question, compute its dimension.
3. From the previous tutorial, we know that $v_1 = \begin{pmatrix} 0 \\ 1 \\ 1 \end{pmatrix}$, $v_2 = \begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix}$, and $v_3 = \begin{pmatrix} 1 \\ 1 \\ 0 \end{pmatrix}$

form a basis of $\mathbb{R}^3$. Compute the coordinates of the vector $\begin{pmatrix} 5 \\ 3 \\ 1 \end{pmatrix}$ relative to this basis.

4. Show that the vectors $1 + t^2$, $2 - t + t^2$, and $t - t^2$ form a basis of the vector space P_2 of polynomials in t of degree at most 2, and compute the coordinates of the vector $t^2 + 4t + 4$ relative to this basis.